REMARKS

This paper is being provided in response to the Office Action mailed November 12, 2003, for the above-referenced application. In this response, Applicants have cancelled claim 3 without prejudice or disclaimer of the subject matter thereof, and amended claims 1, 7, 8, 11, 12 and 15 to clarify that which Applicants consider to be the invention. Further, Applicants have amended the specification and drawing according to the guidelines set forth in the Office Action. Applicants respectfully submit that the amendments to the claims are fully supported by the originally-filed specification and that the amendments to the specification and drawings do not add new subject matter.

The objection of the title as not being descriptive is addressed by amendments contained herein herein. Applicants have amended the title to read "Optical Head for Optical Recording Having a Hologram Element that Generates Multiple Diffracted Light Beams of Different Orders." Accordingly, Applicants respectfully submit that the amended title is sufficiently descriptive and respectfully request that this objection be reconsidered and withdrawn.

The objections to the specification and claims for informalities are addressed by amendments contained herein according to the guidelines set forth in the Office Action. Accordingly, Applicants respectfully request that these objections be reconsidered and withdrawn.

The objection to the drawings under 37 C.F.R. 1.83(a) as lacking a showing of the feature of a hologram element having a first diffraction grating on a surface of the element and a second

diffraction grating on an opposite surface thereof is hereby traversed and reconsideration is respectfully requested. Applicants respectfully direct attention to Figures 9A-9C and page 42, line 24 to page 43, line 6 of the present application. Figures 9A-9C show a hologram element 4C in which an upper grating 37a is formed on the upper surface of the element 4C and a lower diffraction grating 37b formed on the lower surface of the element 4C. As shown in Figures 9A and 9B, the upper grating 37a is linear and the lower grating 37b is arc-shaped. Applicants respectfully submit that the feature as claimed is adequately shown in the drawings. Accordingly, Applicants respectfully request that this objection be reconsidered and withdrawn.

The objections to the drawings for informalities are addressed herein according to the guidelines set forth in the Office Action. Applicants have amended the figures as noted above. Specifically, Applicants respectfully submit that Figures 2C, 3C, 5C, 6, 8C and 9D are schematic illustrations of signal generation and processing of an optical detector in an optical head according to the prior art (Figs. 2C and 3C) and according to the present invention (Figs. 5C, 6, 8C and 9D). In each figure, Applicants show the connections of multiple signal amplifiers. Applicants have added figure legends and made corresponding amendments to indicate and clarify the separate connections of the signal amplifiers (FE, TE(PP) and TE(DPD)) to the leads of the current-to-voltage conversion amplifiers. Applicants respectfully submit that the figures match the corresponding equations and respectfully request that the objections be reconsidered and withdrawn.

The rejection of claims 1-3 and 8 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,570,333 to Katayama (hereinafter "Katayama") is hereby traversed and reconsideration is respectfully requested.

Independent claim 1, as amended herein, recites an optical head. A light source emits a light beam to be irradiated to an optical recording medium as an incident light beam. A hologram element receives a reflected light beam generated by reflection of the incident light beam on the medium to generate at least two diffracted light beams for focusing error detection and at least two diffracted light beams for tracking error detection. An optical detector detects the at least two diffracted light beams for focusing error detection and the at least two diffracted light beams for tracking error detection. The detector includes a first receiving surface for receiving the diffracted beams for focusing error detection and a second detection surface for receiving the diffracted light beams for tracking error detection. Each of the first and second receiving surfaces is divided into receiving regions that receive the focusing error detection beams and the tracking error detection beams, respectively. Further, the hologram element has diffraction gratings divided by at least one division line, said gratings having different grating patterns and at least one of the grating patterns being non-linear and having an offset center with respect to another of said different grating patterns. The at least two diffracted light beams for focusing error detection and the at least two diffracted light beams for tracking error detection are generated by said gratings of said element. Claims 2-7 depend directly or indirectly on independent claim 1.

Independent claim 8, as amended herein, recites an optical head. A light source emits a light beam to be irradiated to an optical recording medium as an incident light beam. A hologram element is included that has gratings divided by at least one division line and having different patterns, at least one of the patterns being non-linear and having an offset center with respect to another of the patterns. The hologram element receives a reflected light beam generated by reflection of the incident light beam on the medium to generate at least two diffracted light beams for focusing error detection and at least two diffracted light beams for tracking error detection by using the gratings. An optical detector detects the at least two diffracted light beams for focusing error detection and the at least two diffracted light beams for tracking error detection. The detector includes a first receiving surface for receiving the diffracted beams for focusing error detection and a second detection surface for receiving the diffracted light beams for tracking error detection. Each of the first and second receiving surfaces is divided into receiving regions that receive the focusing error detection beams and the tracking error detection beams, respectively. Claims 9-11 depend directly or indirectly on independent claim 8.

The Katayama reference discloses an optical head device for a magneto-optical disk. The optical head device includes a diffractive element having a diffraction efficiency that is dependent on a polarization direction of incident light. The diffracted light is split into beams having polarized components orthogonal to each other. (See Abstract and Figures 2-4 of Katayama).

Applicants' independent claims, as amended herein, all recite at least the features of an optical head with *a hologram element including diffraction gratings divided by at least one division line, said gratings having different patterns, and wherein at least one of said patterns is non-linear and has an offset center with respect to another of said grating patterns.* As shown, for example, in Figures 5A-C and 8A-C, Applicants have found that a hologram element as claimed produces a zero-order diffracted light beam, two $+1^{st}$-order diffracted light beams focusing forward with respect to the zero-order diffracted light beam, and two -1^{st}-order diffracted light beams focusing backward with respect to the zero-order diffracted lights beam. (See, for example, page 26, line 21 to page 27, line 8 and page 38, lines 2-9 of the present application). The result is that the allowable positioning margin of the optical components is increased, relaxing the relative positional relationship between the package and the other optical elements. (See, for example, page 32, lines 8-14 of the present application).

Applicants respectfully submit that Katayama does not teach or fairly suggest at least the above-noted features as claimed by Applicants. Specifically, Katayama discloses a diffractive element having diffractive patterns, but does not disclose non-linear patterns having offset centers that produces the multiple diffracted beams of zero and first order. Applicants respectfully submit that Katayama does not teach or fairly suggest at least the features of an optical head with *a hologram element including diffraction gratings divided by at least one division line, said gratings having different patterns, and wherein at least one of said patterns is non-linear and has an offset center with respect to another of said grating patterns*, as claimed by Applicants. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 1-4, 8 and 12 under 35 U.S.C. 102(e) as being anticipated by U.S. Patent No. 5,956,302 to Maeda et al. (hereinafter "Maeda") is hereby traversed and reconsideration is respectfully requested.

The features of independent claims 1 and 8 are discussed above. Claims 2-4 depend on independent claim 1.

Independent claim 12, as amended herein, recites an optical head. A light source emits a light beam to be irradiated to an optical recording medium as an incident light beam. A hologram element is included that has a first diffraction grating on a surface of the element and a second diffraction grating on an opposite surface thereof, the first and second gratings having different patterns, at least one of the patterns being non-linear and having an offset center with respect to another of the patterns. The hologram element receives a reflected light beam generated by reflection of the incident light beam on the medium to generate at least two diffracted light beams for focusing error detection and at least two diffracted light beams for tracking error detection by using the gratings. An optical detector detects the at least two diffracted light beams for focusing error detection and the at least two diffracted light beams for tracking error detection. The detector includes a first receiving surface for receiving the diffracted beams for focusing error detection and a second detection surface for receiving the diffracted light beams for tracking error detection. Each of the first and second receiving surfaces is divided into receiving regions that receive the focusing error detection beams and the

tracking error detection beams, respectively. Claims 13-15 depend directly or indirectly on independent claim 12.

The Maeda reference discloses a high density double diffraction grating constructed with two high-density diffraction gratings superposed on each other. The gratings may have different pitch angles. (See Abstract and Figure 5 of Maeda).

Applicants respectfully submit that Maeda does not teach or fairly suggest at least the features of an optical head with *a hologram element including diffraction gratings divided by at least one division line, said gratings having different patterns, and wherein at least one of said patterns is non-linear and has an offset center with respect to another of said grating patterns*, as claimed by Applicants. Maeda discloses the use of linear diffraction gratings having various pitch angles formed on the surfaces of prisms; however, no mention is made of non-linear diffraction grating patterns to generate multiple diffraction beams of different orders. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 5-7 under 35 U.S.C. 103(a) as being unpatentable over Katayama in view of U.S. Patent No. 5,687,155 to Fukakusa et al. (hereinafter "Fukakusa") is hereby traversed and reconsideration is respectfully requested.

The features of independent claim 1 are discussed above. Claims 5-7 depend thereon.

The Katayama reference is discussed above.

The Fukakusa reference discloses an optical integrating element and integration type optical pickup device. The Office Action cites Fukakusa as disclosing an optical head and an optical detector located in a package having a positioning mechanism.

Applicants respectfully submit that Fukakusa fails to overcome the above-noted deficiencies of the Katayama reference with respect to Applicants' claims. Specifically, Applicants respectfully submit that neither Fukakusa nor Katayama, taken alone or in combination, teach or fairly suggest at least the features of an optical head with *a hologram element including diffraction gratings divided by at least one division line, said gratings having different patterns, and wherein at least one of said patterns is non-linear and has an offset center with respect to another of said grating patterns*, as claimed by Applicants. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 9-11 and 13-15 under 35 U.S.C. 103(a) as being unpatentable over Maeda in view of Fukakusa is hereby traversed and reconsideration is respectfully requested.

The features of independent claims 8 and 12 are discussed above. Claims 9-11 and 13-15 depend thereon.

The Maeda and Fukakusa references are discussed above.

Applicants respectfully submit that Fukakusa fails to overcome the above-noted deficiencies of the Maeda reference with respect to Applicants' claims. Specifically, Applicants respectfully submit that neither Fukakusa nor Maeda, taken alone or in combination, teach or fairly suggest at least the features of an optical head with *a hologram element including diffraction gratings divided by at least one division line, said gratings having different patterns, and wherein at least one of said patterns is non-linear and has an offset center with respect to another of said grating patterns*, as claimed by Applicants. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Based on the above, Applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4038.

Respectfully submitted,
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